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have the spiral arrangement. The leaf traces arise in the cortex, between the cotyledonary bundles, and there are three for each leaf. Girdling is acquired early. There is no clearly differentiated root structure in the embryo.

The manner of germinating is the same as that described for other cycads. The tardily appearing root is tuberized by the activity of a zone of cambium which appears immediately within the endodermis, and proliferates to such an extent that the components of the root cylinder are displaced and the cortex is exfoliated. The root cylinder may be diarch, triarch, or tetrarch, and reduces toward the tip. In its lower part all the tissues are well differentiated, even the endodermis and pericycle. The stems of young seedlings have no secondary wood, the cylinder being composed entirely of endarch leaf traces, which become mesarch farther out in the leaf. The pith of this siphonostelic stem sometimes contains a few isolated vessels. Contrary to the usual custom of looking upon these vessels as remnants of the embryonal protostele, the author prefers to regard them as vestiges of ancestral structure.

MATTE corroborates the discoveries made by LAND and the reviewer that the cotyledonary node of Zamia is of the usual cycad type, that there is a tendency to lobing at the tips of some of the cotyledons, and that there is an irregularly arranged cortical cambium, though he describes the last as vaguely cambiform, and does not attribute to it any phylogenetic significance.

The microphotographs are a retrogression from the clear and beautiful drawings of the earlier papers.—HELEN A. DORETY.

Temporary anaerobiosis.—NABOKICH has published from time to time in the past ten years short papers upon the behavior of plants under anaerobic conditions; now he gives us a monograph on the temporary anaerobiosis of higher plants.[3] There is an elaborate consideration (45 pp.) of the previous work, practically all of which is decidedly adverse to his views. Then follows the experimental part, showing how anaerobic growth is recognizable and presenting the results of an analysis of its physiological characteristics, its periodicity, dependence on temperature, rôle of sugar and alcohol, energetics, and cell division.

NABOKICH reports two categories of physiological facts which are not clearly consonant. On the one hand, anaerobic growth seems to be identical with aerobic as to the grand period, geotropic response, and cell division (including karyokinesis). On the other hand, there are peculiarities of anaerobic growth, such as the course of its curve at different periods (though this can be paralleled in aerobic growth under proper conditions), its specific dependence upon temperature and sugar solutions, and the invariable death of the cells. Though NABOKICH holds that his experiments have fully established his fundamental assumption of the capacity of higher plants for anaerobic growth, he confesses that he has not succeeded in obtaining an amount of growth beyond the limits of possible fortuitous alteration in length by turgor changes; but he thinks this explanation precluded by the different behavior of the plants with sugar solutions under aerobic and anaerobic conditions respectively. Because of the great increase in growth late in the culture period, he also rejects the possibility of anaerobic growth being due to residual oxygen, even though there must be some not removable by his methods. Taking everything into consideration, NABOKICH believes that aerobic and anaerobic growth have no necessary connection, being called forth by different factors.

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[3] NABOKICH, A. J., Temporäre Anaerobiose höherer Pflanzen. Landw. Jahrb. **38**:51–194. *pls. 1, 2. figs. 2.* 1909.

A reading of this paper leaves one unconvinced that the author has established his point, in spite of the apparently prodigious labor the prolonged and very difficult research has involved, with results of minimal consequence. It seems another case of the mountains in labor.—C. R. B.

Hybridization.—GIGLIO-TOS[32] publishes an attempt to reach theoretical explanation of the varied phenomena of hybridization. His views are based on his theory of "biomolecular addition" which may be briefly stated. He supposes that a fertilized egg, *A*, consists of a series of molecules *a*, *b*, *c*, *d*, *e*, ... , and that after a series of chemical transformations owing to assimilation they arrive finally at a chemical constitution *m*, *n*, *o*, *p*, *q*, ... , after which each divides into 2*a*, 2*b*, 2*c*, 2*d*, 2*e*, ... , bringing a return to the original condition. When this occurs, "regeneration of the germ" would be complete. In sexual reproduction if ♂*A* and *B*♀ represent the biomolecules of the two germ cells, the organism developed from the fertilized egg, ♂*AB*♀, might have the capacity of regenerating the whole "biomolecule" which formed it, in which case we would have parthenogenesis; or if complete regeneration is not possible we will have sexual reproduction, each of the germ cells regenerating a part. The case in plants, in which both sexes are usually present in the same individual, is not specifically considered.

From this point of view the writer interprets sexuality, synapsis and reduction, fertilization and hybridization. It is further supposed that the zygote *AB*, while retaining an equal number of male and female biomolecules, yet in the ontogeny undergoes certain modifications, so that the resulting germ cells will be ♂*M* and *N*♀; and that the constitution of these is such that they can be added to each other ("biomolecular addition") to produce again ♂*AB*♀.

On this basis the results of crossing are considered from an a-priori point of view and a number of "laws" are enunciated. Explanations of Mendelian segregation, blending, and other phenomena of hybridization are offered, and predictions made as to the results of cross-breeding reciprocal hybrids. The formal character of the hypothesis makes it probable that it will fail to conform to many of the facts of hybridism, but its viewpoint is very suggestive. For the details of its application see the original paper.—R. R. GATES.

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[32] GIGLIO-TOS, ERMANNO, L'eredità e le leggi razionali dell' ibridismo. Biologica **2**:no. 10. pp. 36. 1908.